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SPECIFICATION FOR DIRECT CURRENT MICROMOTOR FOR CASSETTE TAPE RECORDERS AND OTHER APPLICATIONS

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Indian Standard

SPECIFICATION FOR DIRECT CURRENT MICROMOTOR FOR CASSETTE TAPE RECORDERS AND OTHER APPLICATIONS

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Indian Standard

SPECIFICATION FOR DIRECT CURRENT MICROMOTOR FOR CASSETTE TAPE RECORDERS AND OTHER APPLICATIONS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 27 November 1980, after the draft finalized by the Rotating Machinery Sectional Committee had been approved by the Electro-technical Division Council.

0.2 This standard has been prepared to cover the technical requirements of direct current micromotors generally used in cassette tape recorders, record players, instrumentation and other such applications.

0.3 The motor is one of the critical parts of the tape recorder for its satisfactory performance. The main requirement of the drive motor is that it should maintain specified speed under normal operating conditions.

0.4 The requirements of cassette tape recorders and record players are specified in the following Indian Standards:

IS : 7594 (Part II)-1975 Specification for magnetic sound tape recording and reproducing equipment (portable cassette): Part II Domestic type

IS : 9272 (Part I)-1979 Specification for disk record playing equipment: Part I Record player

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the mechanical values, performance requirements, methods of test and also dimensions of the direct current (dc)

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*Rules for rounding off numerical values (*revised*).

motor, fitted with speed governors, or without speed governors, used in cassette tape recorders for driving capstan of the cassette tape deck mechanism.

1.2 It is noted that these motors are either fitted with internal speed governor or external speed governor.

1.3 The motors covered by this standard may also be used for record players, instrumentation and other similar applications.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions covered in IS : 1885 (Part XXXV)-1973* shall apply.

3. METHOD OF COOLING

3.1 The method of cooling of motors shall be natural cooling and surface ventilation 1C00 as given in IS : 6362-1971†.

4. TYPE OF ENCLOSURE

4.1 The motors shall be totally enclosed type (*see* IS : 4691-1968‡). The protection provided by enclosure shall make the motor suitable for meeting the climatic tests given in **8.5**.

4.1.1 A shielding case may be provided on the motor to prevent stray magnetic interference.

5. GENERAL CONSTRUCTION

5.1 Mounting — The motor may be provided with three, four or six holes (as agreed), duly tapped on end shield, equispaced in angular position in the same plane for fixing motor in position.

5.2 Supply Connection — The motor shall be provided with supply lead or suitable terminations as agreed between the manufacturer and the user.

5.3 Constructional Features — The motors shall be processed in a careful and workmanlike manner. The manufacturer shall use good measurement and production techniques to ensure the highest degree of product reliability and uniformity practicable with the materials used in the product.

5.3.1 The enclosure of the motor shall be of magnetic material to avoid stray magnetic field.

5.3.2 The motor shall have self-lubricating bearings.

---

*Electrotechnical vocabulary: Part XXXV Rotating machinery.

†Designation of methods of cooling of rotating electrical machines.

‡Degrees of protection provided by enclosure for rotating electrical machinery.

5.3.3 The insulating materials used shall be in accordance with IS : 1271-1958* as far as insulation class is concerned.

5.3.4 The motor shall be provided with spark suppression devices so as to comply with the requirements of **8.8**.

5.3.5 It is recommended that brushes and spring material, when used, shall be plated with precious metal so as to comply with the requirements of **8.7** and **8.8**.

5.3.6 All materials and components used in the manufacture of the motor shall conform to the relevant Indian Standard wherever they exist. In case of any difficulty in complying with this requirement, it shall be subject to agreement between the manufacturer and the purchaser.

5.3.7 *Finish* — All external surfaces shall be adequately protected.

6. PREFERRED RATED VOLTAGE, TORQUE AND SPEED

6.1 Preferred Rated Voltage

6.1.1 *Motors Fitted With Speed Governors* — 4·5, 6, 7·5, 9 and 12 V.

6.1.2 *Motors Without Speed Governors* — 2·5, 3, 3·5, 4, 4·5, 5 and 6 V.

6.2 The minimum rated torque of the motor shall be $98·1 \times 10^{-5}$ Nm (10 gf·cm).

6.3 Speed — The preferred speed of the motor at a rated torque and rated voltage shall be 1 350, 2 000 and 2 150 rev/min.

7. DIMENSIONS

7.1 The recommended dimensions of micromotors are given in Table 1.

7.2 Considering the variety of usage and application, it may be necessary that motors covered by this standard may have dimensions as agreed between the manufacturer and the purchaser.

8. GENERAL CHARACTERISTICS

8.1 Torques

8.1.1 With rated voltage applied to motor terminals, the starting torque shall be not less than 345×10^{-5} Nm (35 gf·cm).

8.1.2 *Motors With Speed Governors* — Under rated voltage, rated torque and rated speed conditions, the input current of the motor shall not exceed 120 percent of the rated current.

---

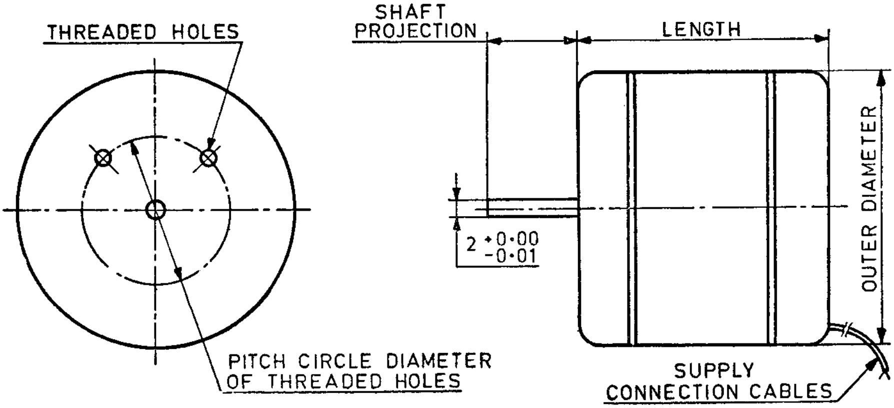
*Classification for insulating materials for electrical machinery and apparatus in relation to their thermal stability in service.

TABLE 1 RECOMMENDED DIMENSIONS OF MICROMOTORS

(*Clause* 7.1 and *Fig.* 1)

PARAMETER	MOTOR WITHOUT SHIELDING CASE *Max*	MOTOR WITH SHIELDING CASE *Max*
(1)	(2)	(3)
	mm	mm
a) Outer diameter	35·0	40·0
b) Length	34·0	36·0
c) Shaft projection	13·0	13·0
d) Shaft diameter	$2^{-0}_{-0.01}$	$2^{-0}_{-0.01}$ (*see* Note)

NOTE — The variation in shaft diameter shall not exceed 0 004 mm (4 microns) from the stated diameter of the motor provided the extreme limits specified in this table are not exceeded.



All dimensions in millimetres.

FIG. 1 DIRECT CURRENT (dc) MICROMOTOR

8.1.3 *Motors Without Speed Governors* — Under rated voltage (tolerance ±10 percent) and rated speed conditions, the input current of the motor shall not exceed the maximum stated input current and shall develop the torque not lower than the rated torque ($98{\cdot}1 \times 10^{-5}$ Nm).

8.1.4 The output torque of the motor shall be determined in accordance with IS : 7572-1974*.

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*Guide for testing single-phase ac and universal motors.

8.2 Efficiency

8.2.1 The efficiency of the micromotor when determined in accordance with IS : 7572-1974*, shall not be less than 50 percent.

8.3 Temperature Rise — The temperature rise of the motor when tested under rated conditions and in accordance with the requirements of this standard, shall not exceed the limits given in Table 2.

TABLE 2 LIMITS OF TEMPERATURE RISE

SL No.	PART OF MOTOR	METHOD OF MEASUREMENT	TEMPERATURE-RISE (°C) FOR CLASS OF INSULATION*		
			A	E	B
1.	Insulated windings including armature winding	R†	60	75	85
2.	Iron parts not in contact with insulated windings	The temperature rise shall in no case reach such a value that there is risk of injury to any insulating material on adjacent parts			

*Classification of insulating material is covered in IS : 1271-1958 Classification of insulating materials for electrical machinery and apparatus in relation to their thermal stability in service.

†Resistance method.

8.3.1 *Measurement of Temperature-Rise* — The measurement of the temperature rise shall be done in accordance with **8.5** of IS : 7572-1974*.

8.4 Speed Variation at Rated Voltage

8.4.1 *Speed at Rated Voltage (Applicable to Motors not Fitted With Internal Speed Governors)* — The speed of the motor shall be within ± 1 percent of the rated speed when tested at rated voltage and rated torque conditions.

NOTE — This requirement is applicable for motors without speed governors.

8.4.2 *Change of Speed With Change in Supply Voltage (Applicable to Motors With Governors only)* — The change in speed shall be not more than ± 2 percent of the rated speed when the motor terminals are supplied with ± 25 percent of the rated voltage.

---

*Guide for testing single-phase ac and universal motors.

8.5 Climatic Sequence Tests

8.5.1 The motors covered by this standard shall meet the following requirements:

a) Dry heat test (at + 40°C) [in accordance with IS : 2106 (Part IV)-1963*],

b) Dry heat — first cycle [in accordance with IS : 2106 (Part II)-1962*],

c) Damp heat — second cycle [in accordance with IS : 2106 (Part II)-1962*] and followed by a recovery period of 24 hours, and

d) Cold test (at – 10°C) [in accordance with IS : 2106 (Part III)-1963*] for a duration of 16 hours.

8.5.2 At the end of climatic sequence tests, the motor shall meet the following requirements:

a) Starting torque, rated torque requirements (*see* **8.1**);

b) Input current (*see* **8.1.2** and **8.1.3**);

c) Variation of speed (*see* **8.4**);

d) Radio interference (*see* **8.8.2**); and

e) Insulation resistance (*see* **8.9**).

8.6 Drop Test — This test should be conducted in accordance with IS : 2106 (Part IX)-1964*, the number of drops being 6 and height of drop being 25 mm. The shaft of the motor shall be kept horizontal during this test. There shall be no mechanical damage to the motor under test.

NOTE — While carrying out the drop test, care shall be taken that motor is not dropped with its shaft downwards.

8.7 Operating Life

8.7.1 The motor covered by this standard shall be subjected to an operating life test consisting of either of the following operating cycle for a total operating period of 600 hours, the operating cycle shall be:

Forward run	165 minutes
Reverse run, (if applicable)	15 minutes
Rest	60 minutes

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*Environmental tests for electronics equipment:
Part II Damp heat (cycling).
Part III Cold test.
Part IV Dry heat test.
Part IX Drop test.

For motors which do not possess the facility for reverse run, the operating cycle shall consist of:

Forward run	180 minutes
Rest	60 minutes

8.7.2 Allowance should be made for normal attention such as change of batteries during this test.

8.7.3 After the operating life test, the motor shall be tested for the following requirements:

a) Torque requirements (*see* **8.1**),
b) Input current (*see* **8.1.2** and **8.1.3**),
c) Variation of speed (*see* **8.4**),
d) Radio frequency interference (*see* **8.8.2**), and
e) Insulation resistance (*see* **8.9**).

8.7.3.1 The various values of requirements so obtained after operating life test shall be within 30 percent of the initial values.

8.8 Quiet Running

8.8.1 *Mechanical Noise (Type Test)* — It shall not be more than 40 dB (reference SPL of 20 μPa) at an ambient noise level up to 20 dB. The micromotor shall be placed horizontally on the rubber pad in the unmounted conditions at a distance of 10 cm from the microphone. The method of test shall be agreed between the manufacturer and the user.

NOTE — As a routine test, this test may be conducted as a visual (inspection) test by running the motor at no load. The motor shall not be too noisy.

8.8.2 *Radio Frequency Interference* — The maximum radio frequency interference noise shall not exceed 0·3 V.

8.8.3 *Electrical Noise (for Motors Fitted With Speed Governors Only)* — The maximum electrical noise shall not exceed 0·3 V.

NOTE — The method of measurement of electrical noise is under consideration.

8.9 Insulation Resistance — The insulation resistance between the windings and the frame shall not be less than 5 megohm when determined at 500 V dc.

8.10 High Voltage — The motor shall be capable of withstanding without failure a test voltage of 500 V ac (50 Hz) between the insulated windings and the frame for a period of 1 minute. For the purpose of routine testing of motors, this voltage test may be conducted for a period of 5 seconds only.

8.11 Switching Test — Under consideration.

9. MARKING

9.1 Each motor shall be marked with the following information:

a) Name of the manufacturer, and
b) Type reference.

9.2 The following information may be supplied with the motor:

a) Name of manufacturer or the trade-mark,
b) Batch number,
c) Rated voltage,
d) Rated speed at rated voltage,
e) Rated torque,
f) Rated input current at full load, and
g) Class of insulation of winding.

9.3 The motor may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

10. TESTS

10.1 Type Tests

10.1.1 Type tests shall consist of the following:

a) Dimensions (*see* **7**);
b) Test for rated torque, starting torque and speed at rated voltage (*see* **8.1**);
c) Test for no-load input current at rated voltage;
d) Efficiency test (*see* **8.2**);
e) Temperature-rise test (*see* **8.3**);
f) Variation of speed test (*see* **8.4**);
g) Climatic sequence test (*see* **8.5**);
h) Drop test (*see* **8.6**);
j) Operating life test (*see* **8.7**);

k) Quiet running test (*see* **8.8**);
m) Insulation resistance test (*see* **8.9**);
n) High voltage test (*see* **8.10**); and
p) Switching test (**8.11**).

10.2 Routine Tests — Routine tests for the micromotor shall comprise items (c) and (k) (mechanical noise and electrical noise only), (m) and (n) of the type tests given in **10.1.1**.

10.3 Acceptance Tests

10.3.1 Acceptance tests for micromotor shall comprise items (b), (c), (d), (e), (f), (k), (m) and (n) of type tests given in **10.1.1**.

10.3.2 For carrying out acceptance tests specified in this standard, the sampling plan given in Appendix A may be followed. However, if desired by purchaser a superior sampling plan, as agreed, may be followed.

APPENDIX A

(*Clause* 10.3.2)

SAMPLING PLAN FOR ELECTRIC MICROMOTORS

A-1. SCALE OF SAMPLING

A-1.1 Lot — In any consignment, all the micromotors of the same type and rating from the same batch of manufacture shall be grouped together to constitute a lot.

A-1.2 The conformity of the lots to the requirements of this specification shall be ascertained for each lot separately. The number of electric motors to be selected for this purpose shall depend upon the size of lot and shall be in accordance with col 1 and 3 of Table 3.

A-1.2.1 These micromotors shall be selected from the lot at random. In order to ensure the randomness of selection, procedures given in IS : 4905-1968* may be followed.

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*Methods for random sampling.

TABLE 3 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES

(*Clauses* A-1.2 *and* A-2.1)

LOT SIZE (1)	STAGE (2)	SAMPLE SIZE (3)	CUMULATIVE SAMPLE SIZE (4)	ACCEPTANCE NUMBER (5)	REJECTION NUMBER (6)
Up to 50	First	5	5	0	1
51 ,, 100	First	8	8	0	1
101 ,, 300	First	8	8	0	2
	Second	8	16	1	2
301 ,, 500	First	13	13	0	2
	Second	13	26	1	2
501 ,, 1 000	First	20	20	0	3
	Second	20	40	3	4
1 001 and above	First	32	32	1	4
	Second	32	64	4	5

NOTE — For lot size up to 100, decision regarding acceptance or rejection of the lot shall be taken at the first stage only.

A-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-2.1 The micromotors at the first stage, selected at random according to col 1 and 3 of Table 3 shall be subjected to each of the acceptance tests. If a micromotor fails in any of the acceptance tests, it shall be termed as defective. The lot shall be considered as conforming to the requirements if the number of defectives found in the sample is less than or equal to the acceptance number (*see* col 5 of Table 3) shall be subjected if it is greater than or equal to rejection number (*see* col 6 of Table 3). If the number of defectives lie between the acceptance number and rejection number, the second sample of the same size shall be chosen at random and tested. If the number of defectives found in the combined sample is greater than or equal to the rejection number, the lot shall be rejected; otherwise the lot shall be accepted.

(*Continued from page* 2)

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